

Pons Hepatis of Quadrate Lobe- A Morphological Variation of Liver

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ABSTRACT

Variations of the liver are mostly encountered related to its shape, number of lobes and the patterns of ligaments attached. Variations related to fissures and vascular supplies are less common. An anatomical variation was observed during routine dissection of a 60 year old male cadaver at Department of Rachana Sharir, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital. The fissure for ligamentum teres was incomplete; which usually extends from inferior border of liver upto a portahepatis. Foramen was created in the inferior surface of liver near to inferior border between quadrate lobe and left lobe of liver. It was passing through the foramina along a tunnel formed by the bridging of hepatic parenchyma in between quadrate lobe and portahepatis and opened at to left border of portahepatis. As a result of parenchymatous bridging, the fissure was absent and so, there was no demarcation of quadrate lobe from the inferior surface of left lobe. The left lobe was extending beyond the left lateral vertical plane. Awareness of such type of anatomical variation can be utilized by anatomists, embryologists, radiologists and surgeons for academic interest, to avoid possible errors in interpretation and subsequent misdiagnosis, and to assist in planning an appropriate surgical approach that is crucial for determining the patient outcome.

KEYWORDS: Liver, fissure, variation, ligamentum teres

INTRODUCTION

The liver is solid, wedge shaped, largest gland of the body and consists of both exocrine and endocrine parts. It occupies most of the right hypochondrium and upper part of epigastrium, and part of the left hypochondrium upto the left lateral vertical plane. The liver has superior, anterior, right lateral, posterior and inferior surfaces and has a distinct inferior border. It is divided into anatomical right and left lobes by the reflection of the falciform ligament on the anterior surface, the fissure for ligamentum teres on the inferior surface, and the fissure for the ligamentum venosum on the posterior surface. The anatomical right lobe is larger than the left lobe and has a caudate and quadrate lobes. The caudate lobe is situated between the fissure for the ligamentum venosum and the groove for the inferior vena cava. It has a caudate process which is a tail like projection arising from the junction of its lower end and right margin and one papillary process in the junction of lower end and left margin of caudate lobe. The quadrate lobe is situated in the inferior surface bounded anteriorly by the inferior border, posteriorly by portahepatis, on the right by fossa for the gall bladder, and on the left by the fissure for the ligamentum teres. The posterior surface of the right lobe has a deep vertical cleft, the fissure for ligamentum venosum

which has anterior and posterior walls, and a floor. Anterior lip and anterior wall of the fissure are covered with peritoneum of greater sac; posterior lip and posterior wall are covered with lesser sac while the floor is non-peritoneal and gives attachment to the hepato-gastric part of the lesser omentum. The floor of this fissure lodges ligamentum venosum which is a remnant of ductus venosus of fetal life.

The inferior surface presents a fissure for ligamentum teres which is a deep cleft, extending from interlobar notch on the inferior border of the liver to the left end of portahepatis. Its lips and the walls are lined by peritoneum of greater sac while its floor is non-peritoneal and lodges ligamentum teres. This ligament is the remnant of obliterated left umbilical vein and extends up to the left branch of portal vein at the portahepatis. The fossa for gall bladder is situated on the inferior surface of the right lobe of the liver and lodges the gallbladder in it. The left lobe of the liver forms only one sixth of the liver and is flattened from above downwards. It presents a rounded elevation called omental tuberosity in the inferior surface near the ligamentum venosum.

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Embryological implications in formation of fissure

Before the appearance of hepatic bud within the septum transversum, the latter is traversed by pairs of umbilical and vitelline veins before their onward march to the sinus venosus of the heart. With the advent of liver in the septum transversum, Right umbilical vein disappears completely and the cephalic part of left umbilical vein regresses until it joins with the infra-hepatic part of left vitelline vein. while the infra-hepatic part of right & left vitelline veins are engaged for the development of portal vein, the infra-hepatic part of those veins breaks up into tufts of capillaries by the growth of the liver cells and persist as the hepatic sinusoids. After birth the left umbilical vein gets occluded and is converted into ligamentum teres. Fissure is formed for passage of this left umbilical vein during foetal life as simultaneously there will be growth and modulation of liver

College of Ayurveda and Hospital, Hassan, Karnataka, a variation of liver found in an adult male cadaver of about 60 year old with heavy built. The liver was removed following the procedure of Cunningham's manual of practical anatomy after observing the features of liver and its associated structures in situ. Gross observation of liver showed morphological variations related to fissure for ligamentum teres which was not seen completely and was extending from inferior border of liver up to midway between the portahepatis and the inferior border. The fissure was ending in a large foramen created in inferior surface of the liver near its junction to the quadrate lobe. A tunnel was formed by the bridging of hepatic parenchyma from quadrate to left lobe; the condition termed as Pons hepatis. The tunnel was explored by dissecting from the foramen to portahepatis and it was observed that the ligamentum teres was passing through the foramen and extending in the tunnel posteriorly and upwards and attached to the left border of portahepatis. It was also observed that in the same specimen, the left lobe was extending beyond the left lateral vertical plane.

CASE REPORT

During routine cadaveric dissection in the department of Rachana Sharir, Sri Dharmasthala Manjunatheshwara

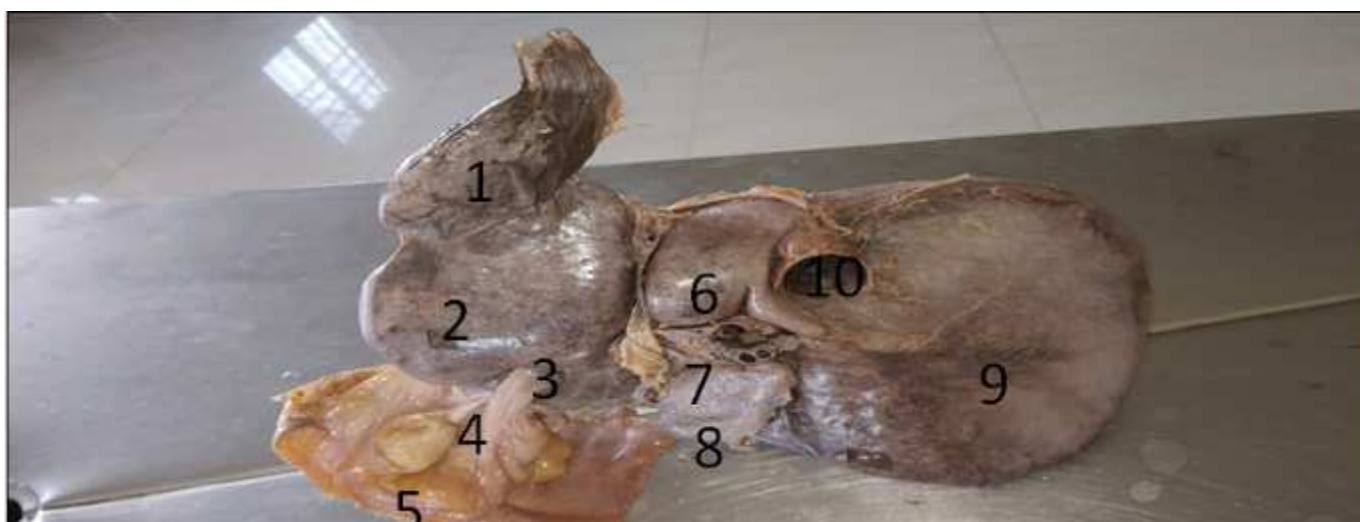


Fig no,1: Posterior view of Liver 1-extension of left lobe, 2- left lobe, 3- pons hepatis of quadrate lobe, 4- ligamentum teres, 5-falciform ligament, 6-caudate lobe, 7-porta hepatis, 8-gall bladder, 9-right lobe, 10-inferior venacava

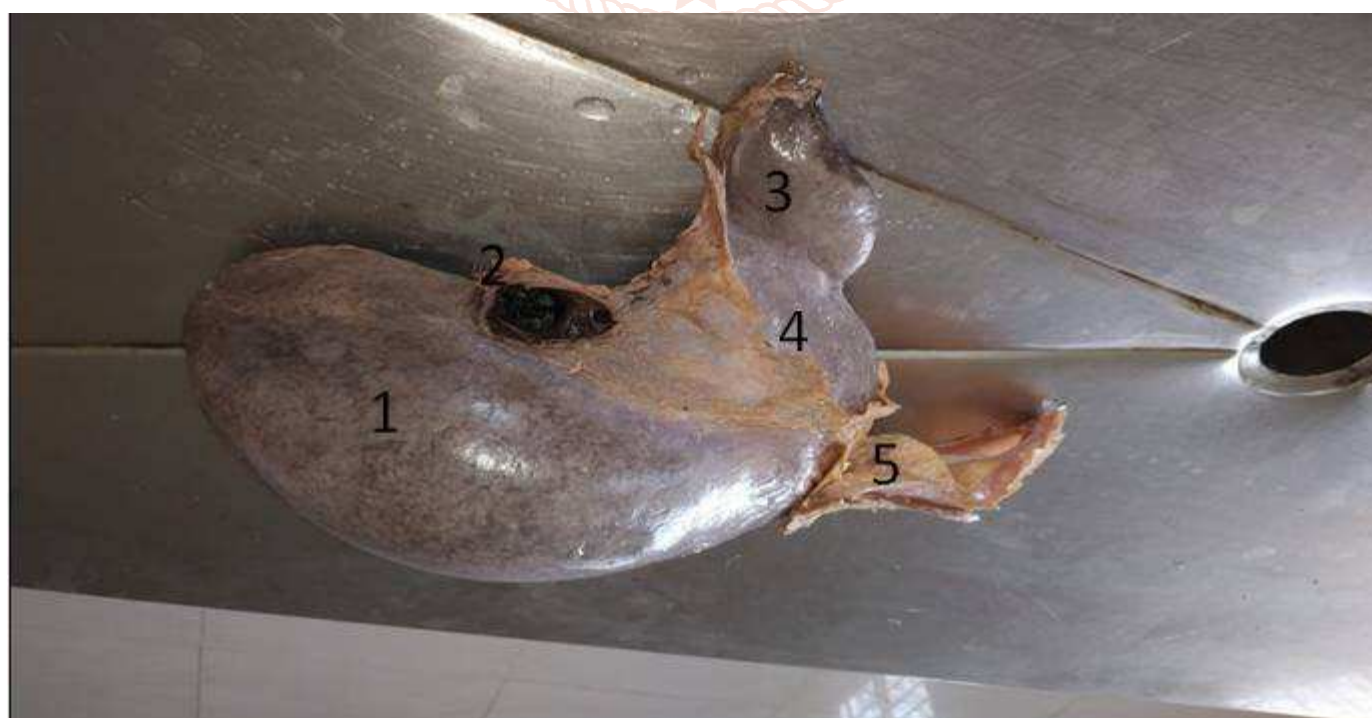


Fig2: Anterior view-1-right lobe,2-inferior venacava,3-elongation of left lobe,4-left lobe,5- falciform ligament

DISCUSSION

Variations in the liver morphology can be either congenital or acquired. The congenital abnormalities of the liver include agenesis, atrophy or hypoplasia of lobes or accessory lobes, accessory fissures are related to the ligaments etc.

The liver develops from an endodermal cystic bud that arises from the ventral aspect of the gut, at the junction between the foregut and midgut. This bud grows into the ventral mesogastrium and passes through it into the septum transversum. It enlarges and shows a division into larger cranial part called the pars hepatica and smaller caudal part called the pars cystica. The right lobe is formed from right part and the left lobe from left part of the pars hepatica during second month of intrauterine life. Right and left lobes are separated by falciform and round ligament. Lack of separation might often result in fusion of lobes during the embryonic period. This could be one of the possible reasons for having a tunnel for ligamentum teres rather than a fissure. The ligamentum teres is formed as a fibrous remnant of left umbilical vein which extends from the umbilicus to the left branch of the portal vein. This ligament with the umbilical vein lie in the free margin of the falciform ligament and then enters its fissure extending from the inferior border of liver to the left end of the portahepatis.

In one of the study conducted by Aktanet. al, it is found that there were absence of left lobe of liver in 2.87% cases among 383 patients by using CT and in 1.85% among 54 cadavers. They also found 4.1% of cadaveric livers having the left lobe fused with quadrate lobe. (2)

Morphological variation of quadrate lobe and ligamentum teres is uncommon. Only limited authors have reported in their studies. Ebby S and Ambike M V reported a case of complete absence of the quadrate lobe with variation in the attachment of ligamentum teres. In such case, the ligamentum teres was present on the inferior free margin of falciform ligament coursing deep through tunnel within the liver substance by totally obscuring the normal fissure for ligamentum teres(4)

Singh H.R & Rabi S noted 22.86% cases of pons hepatis in his study of 70 formalin fixed liver (3)

In present study, the fissure for ligamentum teres was not present, on the left side quadrate lobe was continuing with inferior surface of left lobe of the liver. The fissure for ligamentum teres was converted in to a foramen as the quadrate lobe which usually lies between fossa for a gallbladder on the right side and fissure for ligamentum teres on the left side and inferior border separating it from anterior surface and postero superior border forming lower lip of portahepatis was seen that on the left side the fissure for ligamentum teres is incomplete, asparanchyma of liver is related to quadrate lobe was merging with inferior surface of left lobe of liver. This has lead to conversion of fissure into a

deep foramen through which the ligamentum teres was seen coursing along with peritoneal ligament obscuring its normal course.

The knowledge of normal and variant morphological anatomy of the liver is important during radiological investigation related to developmental variation, pathological implications, diagnosis and suitable interventions. In cases of the pons hepatis bridging the fissure for ligamentum teres, normal visualisation of the fissure would not be possible and it might create confusion to radiologist to predict the dimensions of right and the left lobes. A very narrow, buried or absent quadrate lobe also may create similar confusion because the fissure for ligamentum teres in such cases would be very near to the left margin of the gall bladder fossa.

CONCLUSION

The present study focuses on morphological variations of liver. The knowledge of this kind of variations is important for surgeons and gastroenterologists in planning and performing the surgical procedures. It is helpful for radiologists to prevent a possible misdiagnosis and for the anatomists to find out new variants. sometimes it may result in blocking the blood supply during foetal life causing death of foetus which needs much more focus .

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